# Complete Summary

## GUIDELINE TITLE

Essential hypertension.

## BIBLIOGRAPHIC SOURCE(S)

University of Michigan Health System. Essential hypertension. Ann Arbor (MI): University of Michigan Health System; 2003 Apr. 13 p. [8 references]

## GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: University of Michigan Health System. Essential hypertension. Ann Arbor (MI): University of Michigan Health System; 2002 Aug. 14 p.

## COMPLETE SUMMARY CONTENT



## SCOPE

### DISEASE/CONDITION(S)

Essential hypertension

### GUIDELINE CATEGORY

Diagnosis
Evaluation
Management
Risk Assessment
Treatment

## CLINICAL SPECIALTY

Family Practice
Internal Medicine

## INTENDED USERS

Advanced Practice Nurses
Physician Assistants
Physicians

## GUIDELINE OBJECTIVE(S)

- To accurately diagnose hypertension
- To improve blood pressure (BP) control
- To decrease hypertension-related morbidity and mortality
- To encourage patient's self-involvement
- To provide appropriate education and follow-up
- To provide cost-effective care

## TARGET POPULATION

Adults age 18 and older (non-pregnant)

## INTERVENTIONS AND PRACTICES CONSIDERED

### Diagnosis and Initial Evaluation

1. Blood pressure measurement (office, home blood pressure monitoring, ambulatory blood pressure monitoring)
2. History and physical examination
3. Laboratory tests and diagnostic procedures (e.g., potassium, blood glucose, creatinine, calcium, urinalysis, lipid panel, electrocardiogram)
4. Other testing and/or referral for secondary hypertension or complicated hypertension
5. Risk stratification

### Treatment/Management

1. Lifestyle modifications
    - Stress reduction
    - Dietary changes
    - Weight reduction and maintenance
    - Adequate physical activity
    - Tobacco avoidance
    - Moderate alcohol intake
2. Drug therapy
    - Diuretics (thiazide or loop)
    - Beta blockers
    - Angiotensin converting enzyme (ACE) inhibitors
    - Angiotensin II receptor antagonists (ARB)

- Calcium channel blockers
- Peripheral alpha blockers in combination with thiazide or other agent
- Centrally-acting alpha-2 agonists
- Direct vasodilators
- Calcium channel blocker/ACE inhibitor combinations
- Potassium sparing/thiazide combination diuretics
- ACE inhibitor/diuretic combinations
- Angiotensin receptor blocker/diuretic combinations

3. Monitoring blood pressure control (home blood pressure monitoring) and follow-up

### MAJOR OUTCOMES CONSIDERED

- Reductions in blood pressure
- Cardiovascular and cerebrovascular morbidity and mortality
- Treatment costs
- Side effects of medications

## METHODOLOGY

### METHODS USED TO COLLECT/SELECT EVIDENCE

Searches of Electronic Databases

### DESCRIPTION OF METHODS USED TO COLLECT/SELECT THE EVIDENCE

Preliminary evidence was identified using literature considered relevant by the National High Blood Pressure Education Program. A search of more recent literature was conducted on Medline prospectively using the major keywords of: hypertension, human adults, English language, clinical trials, guidelines, and published since 1/1/99. Terms used for specific topic searches within the major key words included: alpha 1 blocker, angiotensin converting enzyme inhibitors, angiotensin II receptor antagonist, beta blockers (selective and non-selective), calcium channel blockers (dihydropyridine and non-dihydropyridine forms), centrally acting alpha-2 agonist, diuretics (thiazide and non-thiazide, loop, potassium-sparing), vasodilator, avoidance (alcohol, stress, tobacco), blood pressure monitoring (ambulatory, home), dietary (caffeine, calcium, garlic, magnesium, onion, potassium, sodium), disease-based management (brain, cardiac, eye, kidney, peripheral vascular), and exercise. Detailed search terms and strategy available from the guideline developer upon request.

The search was conducted in components each keyed to a specific causal link in a formal problem structure (available from the guideline developer upon request). The search was supplemented with very recent information available to expert members of the panel, including abstracts from recent meetings and results of clinical trials. Negative trials were specifically sought. The search was a single cycle.

### NUMBER OF SOURCE DOCUMENTS

Not stated

## METHODS USED TO ASSESS THE QUALITY AND STRENGTH OF THE EVIDENCE

Weighting According to a Rating Scheme (Scheme Given)

## RATING SCHEME FOR THE STRENGTH OF THE EVIDENCE

Levels of Evidence

A. Randomized controlled trials
B. Controlled trials, no randomization
C. Observational trials
D. Opinion of expert panel

## METHODS USED TO ANALYZE THE EVIDENCE

Systematic Review

## DESCRIPTION OF THE METHODS USED TO ANALYZE THE EVIDENCE

Conclusions were based on prospective randomized clinical trials if available, to the exclusion of other data; if randomized controlled trials were not available, observational studies were admitted to consideration. If no such data were available for a given link in the problem formulation, expert opinion was used to estimate effect size.

## METHODS USED TO FORMULATE THE RECOMMENDATIONS

Expert Consensus

## DESCRIPTION OF METHODS USED TO FORMULATE THE RECOMMENDATIONS

Consideration of benefits, harms, costs, and patient preferences

## RATING SCHEME FOR THE STRENGTH OF THE RECOMMENDATIONS

Not applicable

## COST ANALYSIS

A formal cost analysis was not performed and published cost analyses were not reviewed.

## METHOD OF GUIDELINE VALIDATION

Peer Review

## DESCRIPTION OF METHOD OF GUIDELINE VALIDATION

University of Michigan health System (UMHS) guidelines are reviewed by leadership and in clinical conferences of departments to which the content is most relevant. This guideline concerning hypertension was reviewed by members of the following departments: Cardiovascular medicine, Family Medicine, General Medicine, and Pharmacy Services. Guidelines are approved by the Executive Committee for Clinical Affairs.

## RECOMMENDATIONS

### MAJOR RECOMMENDATIONS

Note from the National Guideline Clearinghouse (NGC): The following key points summarize the content of the guideline. Refer to the full text for additional information, including detailed information on dosing, possible side effects, and cost of medications and considerations for pregnant patients. The levels of evidence (A, B, C, D) are defined at the end of the "Major Recommendations" field.

#### Diagnosis

- Although a single, carefully taken blood pressure (BP) reading may predict future cardiovascular risk, this risk is better identified by taking the mean BP level from recordings over several visits.
- Careful calibration of the BP monitor and thorough patient education are essential if home BP monitoring is used.
- If accurate home BP monitoring is not available or desirable, consider ambulatory BP monitoring to confirm the diagnosis for newly suspected hypertensive patients [evidence: B*].

#### Treatment

- For patients without diabetes or end organ damage, the target of BP therapy is less than 140/90 mmHg [A*].
- For patients with diabetes or end organ damage (e.g., renal insufficiency, retinopathy, congestive heart failure [CHF], coronary artery disease [CAD], peripheral vascular obstructive disease [PVOD], cerebrovascular disease), aggressive treatment of hypertension (HTN) provides significant improvements in clinical outcomes [A*]. Systolic goals have not been specifically defined. A target systolic blood pressure of 135 mmHg or less [D*] and diastolic BP goal of 80 mmHg or less [B*] is recommended based on trials to date.
- Treatment of systolic blood pressure (SBP) over 160 mmHg is important in reducing cerebrovascular accident (CVA) and congestive heart failure risk.
- Lifestyle modifications to lower BP are important adjuncts to drug therapy [A*].
- Begin therapy with a thiazide diuretic for almost all patients and add second and third agents as needed to achieve effective BP reduction goals [A*]. Beta-blockers, angiotensin-converting enzyme (ACE) inhibitors, and long-acting dihydropyridine calcium channel blockers are the first choice additional agents. Other specific illnesses may guide the choice of agent(s): especially ACE inhibitors (angiotensin II receptor antagonists (ARB) for those unable to

tolerate ACE) for patients with renal disease or diabetes with microalbuminuria or left ventricular (LV) dysfunction, and beta-blockers for those with coronary artery disease or congestive heart failure.
- Over 70% of individuals require two or more drugs to achieve BP goals and usage of fixed combination therapy may be cost-effective. Once a day medications increase compliance and are preferred.

Definitions:

Levels of Evidence

Levels of evidence reflect the best available literature in support of an intervention or test:

A. Randomized controlled trials
B. Controlled trials, no randomization
C. Observational trials
D. Opinion of expert panel

## CLINICAL ALGORITHM(S)

None provided

## EVIDENCE SUPPORTING THE RECOMMENDATIONS

### TYPE OF EVIDENCE SUPPORTING THE RECOMMENDATIONS

The type of supporting evidence is identified and graded for each recommendation (see Major Recommendations).

Conclusions were based on prospective randomized clinical trials if available, to the exclusion of other data; if randomized controlled trials were not available, observational studies were admitted to consideration. If no such data were available for a given link in the problem formulation, expert opinion was used to estimate effect size.

## BENEFITS/HARMS OF IMPLEMENTING THE GUIDELINE RECOMMENDATIONS

### POTENTIAL BENEFITS

- Improved diagnosis of hypertension
- Improved blood pressure control
- Decreased hypertension-related end-organ damage and consequent morbidity and mortality
- Improved patient involvement in care

Patients with risk factors for cardiovascular disease and target organ damage are most likely to benefit (see original guideline document for list of risk factors).

### POTENTIAL HARMS

### Thiazide Diuretics

- Increase the frequency of sexual dysfunction in men
- Cause a short-term increase in low-density lipoprotein (LDL) cholesterol; however, long-term trials have shown minimal change.
- Have a minimal effect on glycemic control in diabetics
- Can increase uric acid, related attacks of gout, and dose-dependent hypokalemia

### Beta-blockers

- Fatigue and impotence are uncommon side effects at the recommended low doses.
- Though beta blockers may raise triglycerides and lower high-density lipoprotein (HDL) cholesterol, these effects have not been found to be clinically significant in outcome

### Angiotensin-Converting Enzyme (ACE) Inhibitors

- Angioedema is a rare side effect (0.1%) which may be life-threatening and may occur at any point in the treatment.
- Renal impairment may occur in patients with bilateral renal artery stenosis or unilateral renal artery stenosis with a single kidney.
- All in this class induce cough equally, which may be disabling enough with some patients to result in the need to discontinue the drug; cough occurs more often in women.

### Angiotensin II Receptor Blockers (ARB)

- Angioedema has been rarely reported with losartan, but has occurred in patients with prior angioedema on angiotensin-converting enzyme inhibitors
- Losartan has a uricosuric effect that is unique compared to others in this class.

### Calcium Channel Blocking Agents

- A class side effect is edema formation, usually around the eyes or ankles, as a consequence of excessive arteriolar or pre-capillary vasodilation, and is more pronounced in the second generation dihydropyridine agents.
- Verapamil has more pronounced bradycardia effects and often results in constipation.

### Peripheral Alpha Blockers

- Peripheral alpha blockers are more likely to result in orthostatic hypotension. The shorter acting agents (e.g., prazosin and terazosin) are more likely to exhibit a first dose effect of syncope due to orthostatic hypotension, which may also occur in the first few days of therapy or with rapid increased dosages.

### Centrally-acting Alpha-2 Agonists

- Dry mouth and sedation are common; may induce bradycardia

Direct Vasodilators

- Induce reflex tachycardia and thus should be combined with a beta blocker or non-dihydropyridine calcium channel blocker.
- Hydralazine may produce a lupus erythematosus-like syndrome; the syndrome is extremely rare when the daily dose is less than 200 mg. Headache, palpitations, anorexia, nausea and at least twice daily dosing requirements limit the usefulness of this drug.
- The most limiting side effects of Minoxidil have been hypertrichosis and fluid accumulation in serous cavities, including the pericardium.

## CONTRAINDICATIONS

CONTRAINDICATIONS

- All angiotensin converting enzyme (ACE) inhibitors and angiotensin II receptor antagonists (ARB) are contraindicated in pregnancy.
- All ACE inhibitors and ARB are relatively contraindicated in patients with bilateral or equivalent renal artery stenosis.
- First generation dihydropyridine calcium channel blockers (DHP CCB) are relatively contraindicated for all coronary artery disease.
- Non-DHP CCBs are relatively contraindicated in congestive heart failure (CHF) -- systolic.
- Diuretic, ACE inhibitors and ARB, alpha-1 blocker, and DHP CCB are relatively contraindicated in cardiomyopathy (hypertrophic).
- Beta blockers are relatively contraindicated in reactive pulmonary diseases
- Diuretics, ACE inhibitors, and ARBs are relatively contraindicated in patients taking lithium
- Calcium channel blocking agents should be avoided as a single agent for patients with microalbuminuria, as they will worsen protein loss, but may be used in combination with ARB or ACE inhibitors. Diltiazem and verapamil should also be avoided in the first 24 to 48 hours of a myocardial infarction.
- Alpha blockers should not be used as initial therapy but may be added to a thiazide or other outcome-improving agent for additional blood pressure (BP) control or when prostatism treatment is desired.
- Thiazide diuretics are not preferred in individuals with renal impairment (serum creatinine $\geq$ 2.5 mg/dl).
- Beta-blockers, non-DHP CCB, and alpha-2 agonists are relatively contraindicated in patients with bradycardia and heart block.

Refer to Table 1 in the original guideline document for additional contraindications and cautions in selecting antihypertensive medications for patients with coexisting conditions.

## QUALIFYING STATEMENTS

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These guidelines should not be construed as including all proper methods of care or excluding other acceptable methods of care reasonably directed to obtaining the same results. The ultimate judgment regarding any specific clinical procedure or treatment must be made by the physician in light of the circumstances presented by the patient.

## IMPLEMENTATION OF THE GUIDELINE

### DESCRIPTION OF IMPLEMENTATION STRATEGY

An implementation strategy was not provided.

### IMPLEMENTATION TOOLS

Patient Resources
Staff Training/Competency Material

For information about availability, see the "Availability of Companion Documents" and "Patient Resources" fields below.

## INSTITUTE OF MEDICINE (IOM) NATIONAL HEALTHCARE QUALITY REPORT CATEGORIES

### IOM CARE NEED

Getting Better
Living with Illness
Staying Healthy

### IOM DOMAIN

Effectiveness
Patient-centeredness

## IDENTIFYING INFORMATION AND AVAILABILITY

### BIBLIOGRAPHIC SOURCE(S)

University of Michigan Health System. Essential hypertension. Ann Arbor (MI): University of Michigan Health System; 2003 Apr. 13 p. [8 references]

### ADAPTATION

Not applicable: The guideline was not adapted from another source.

### DATE RELEASED

1997 (revised 2003 Apr)

## GUIDELINE DEVELOPER(S)

University of Michigan Health System - Academic Institution

## SOURCE(S) OF FUNDING

University of Michigan Health System

## GUIDELINE COMMITTEE

Hypertension Guideline Team

## COMPOSITION OF GROUP THAT AUTHORED THE GUIDELINE

Team Members: William Barrie, MD, General Medicine; Janice Stumpf, PharmD, Pharmacy; Kenneth Jamerson, MD, Hypertension; Philip Zazove, MD, Family Medicine

Consultant: Lee Green, MD, MPH, Family Medicine

Guidelines Oversight Team: Connie Standiford, MD; Lee Green, MD; Van Harrison, PhD

## FINANCIAL DISCLOSURES/CONFLICTS OF INTEREST

The University of Michigan Health System endorses the Guidelines of the Association of American Medical Colleges and the Standards of the Accreditation Council for Continuing Medical Education that the individuals who present educational activities disclose significant relationships with commercial companies whose products or services are discussed. Disclosure of a relationship is not intended to suggest bias in the information presented, but is made to provide readers with information that might be of potential importance to their evaluation of the information.

Team Member; Company; Relationship

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## GUIDELINE STATUS

This is the current release of the guideline.

This guideline updates a previous version: University of Michigan Health System. Essential hypertension. Ann Arbor (MI): University of Michigan Health System; 2002 Aug. 14 p.

## GUIDELINE AVAILABILITY

Electronic copies: Available in Portable Document Format (PDF) from the University of Michigan Health System Web site.

## AVAILABILITY OF COMPANION DOCUMENTS

Continuing Medical Education (CME) information is available from the University of Michigan Health System Web site.

## PATIENT RESOURCES

The following is available:

- Hypertension (high blood pressure). University of Michigan Health System; 2002 Oct. Various p. Electronic copies: Available from the University of Michigan Health System Web site.
- Home blood pressure monitoring. Patient instructions. University of Michigan Health System; 2003 Apr. Various p. Electronic copies: Available from the University of Michigan Health System Web site.

Please note: This patient information is intended to provide health professionals with information to share with their patients to help them better understand their health and their diagnosed disorders. By providing access to this patient information, it is not the intention of NGC to provide specific medical advice for particular patients. Rather we urge patients and their representatives to review this material and then to consult with a licensed health professional for evaluation of treatment options suitable for them as well as for diagnosis and answers to their personal medical questions. This patient information has been derived and prepared from a guideline for health care professionals included on NGC by the authors or publishers of that original guideline. The patient information is not reviewed by NGC to establish whether or not it accurately reflects the original guideline's content.

## NGC STATUS

This NGC summary was completed by ECRI on March 19, 2003. The information was verified by the guideline developer on April 23, 2003. This NGC summary was updated by ECRI on September 13, 2005. The updated information was verified by the guideline developer on September 20, 2005.

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